INTERMOUNTAIN POWER PROJECT
SPARE PARTS REVIEW

MINUTES OF MEETING

Date:April 11, 2001

Place: Intermountain Power Project, Delta, Utah

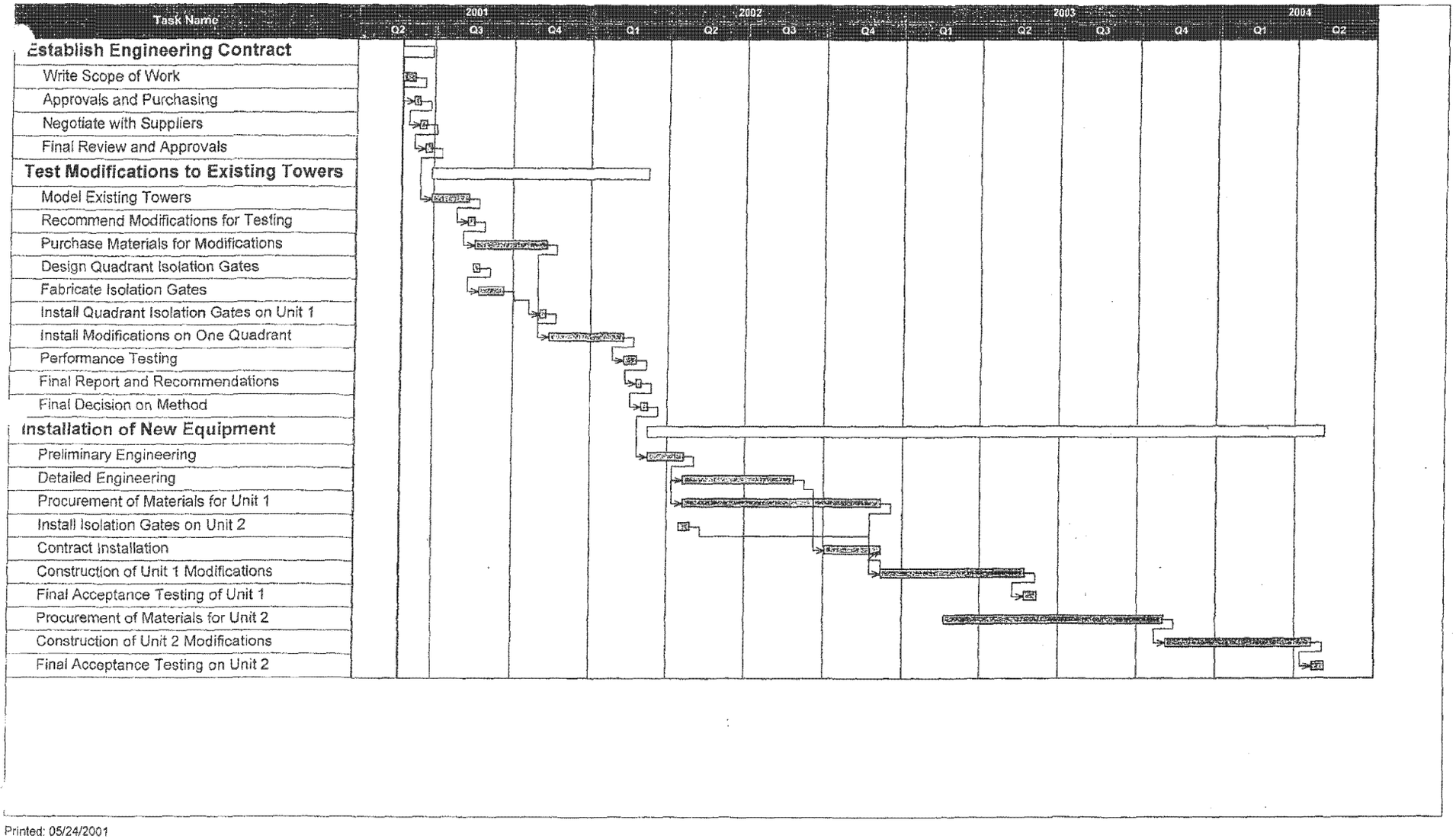
Subject: To identify large expense capital items that would substantially effect energy production if the item were to fail and would be subject to long lead times to replace.

Participants:

Jerry Hintze	IPSC
Michael Gaines	RWB
John Bakken	RWB
Jon Finlinson	IPSC
David Allen	
Mike Alley	
Mark Chaise...	
Randy Uttley	
Vance Bishop	
Gary Gould	
Kelly Cloward	
Lee Tanner	
Kevin Miller	
Dale Hurd	
John Howard	
Jon Christensen	
Neil Clay	
Jim Knap?	
Joe Hamblin	
Rick Houston	
Aaron Nissen	

The purpose of the meeting was to generate a list of large spare parts that could be further reviewed for economic feasibility of adding to inventory. The list was limited to spares with a cost above $50,000, although most of the items discussed were above $100,000. As part of the discussion, the group decided to assign two ratings to each item discussed. The rating was based on a 10 high system and the two elements addressed included; (1) The risk of the part failing, and (2) should the part fail, and a replacement was not available, what would be the effect on unit availability? (The ratings were assigned on a 1 to 10 scale with 1 being a low risk of failure/low reduction of availability and 10 being high risk of failure/large reduction in availability.)

Cooling Tower Betterment Project



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The following items were identified as potential items for discussion. A summary of the points made during the meeting follows each item.

1. **Iso-Phase Bus Duct:** (Risk 5, Availability 10)
   There are no spare bus duct components presently available at the plant in the spares inventory, except for support insulators. A full bus duct section potentially would have a long lead-time for delivery. This issue is complicated by the modifications necessary to the existing bus work to accommodate design changes for cooling to support the upgrade of the high-pressure turbine and increased capacity.

   The decision on this item is to obtain a minimum of three spares; one straight section of bus duct, together with one inside and one outside 90-degree elbows. The straight section of bus duct could also serve as an emergency spare for the generator circuit breaker. This could be used if it was decided to bypass the circuit breaker in the event there were a catastrophic failure of the generator circuit breaker.

   Our suggestion is that obtaining spares not be delayed if a decision is deferred about implementing the HP Dense Pak. IPSC agreed to take responsibility for getting spares.

2. **Generator Rotor:** (***Shaft Forging***: Risk 1, Availability 10; ***Field Winding***: Risk 3, Availability 10) For discussion purposes the Generator (which is a model S-2) was divided into two components, being the stator and the rotor. The Generator Rotor was also addressed in two pieces as indicated above in the risk assignments. The argument was made that the risk of a failure occurring that destroys the forging is so remote that it is not economically prudent to obtain a spare forging. With regard to the Field Winding, there is a risk of failure and it would take a unit off-line if a failure were to occur.

   Based on a brief call to General Electric, generator parts can take about 36 months to obtain. Based on this information it would be prudent to obtain a Generator Rotor Rewind Kit to have as a spare. The action item for obtaining a rewind kit was assigned to IPSC.

   As a separate activity, RW Beck will canvas other S-2 generator owners to (1) determine what spares are being held in inventory by other utilities and (2) the interest level in sharing spares with IPP. To support this work Jon Christensen (IPSC) agreed to provide a list of other S-2 owners, of which he reported there are about 11. The Southern Company was specifically mentioned as having four.

3. **Generator Stator:** (***Core (iron):*** Risk 1, Availability 10: ***Winding:*** Risk 7-8, Availability 10). The Generator Stator Core was approached in the same manner as failure of the shaft forging for the Generator Rotor. However, failure of the stator winding is a much more likely event, i.e. carries a high risk. Information from the generator manufacturer, GE, indicates that the delivery time for a rewinding kit is on the order of 12 – 18 months, (which needs to be verified). GE quoted the cost of a rewinding kit in 1994 at about $1 million. Proper storage facilities for a rewind kit would need to be arranged. There was general agreement that at a minimum, a rewind kit for the generator stator should be added to the list of spares. This was reinforced with a discussion of the concern about leaks in the existing stator bars that could be aggravated when the unit is up-rated.

IPSC agreed to add to their capital budget, acquisition of a rewind kit. RWB agreed to look into options of sharing spares with other users of the same S-2 generating unit. As another alternative, it was mentioned that Dayton Power's Killen Station may have an older generator on the order of 750MW, which may have a spare generator that could be acquired. It was believed that the generator is not an S-2 unit and it would require a separate study to (1) determine if a spare generator is available and to (2) look into design issues for compatibility with the existing equipment.

4. **Excitation System:** (Risk 4, Availability 6-7)
The existing excitation system was reported to be obsolete and spare parts are generally not available. There are three rectifier bridges in the system, two of which are required for normal operation.

IPSC will study replacing this system on both units and using the existing systems for spares.

5. **Low Pressure Rotor:** (Risk 1, Availability 10)
Turbine rotors were discussed as another category of equipment for consideration. It should be pointed out that rotor failures at other plants have occurred where intergranular stress corrosion cracking (IGSCC) has been a problem. As a reference point, nine low-pressure rotors for the three units at Palo Verde are now being replaced because of this problem. In general, this has been a result of water chemistry issues and there have been indications before problems occurred. Based on water chemistry at IPP and experience to date with the two units, IPSC staff assessed the risk of a failure of any of the rotors as very low. It was also generally agreed among those at the meeting that even a failure of turbine blades (buckets) would not result in a long down-time, since the most likely scenario would be to loose the end buckets, which are larger and a row could be blanked off without de-rating the unit. It was also argued that their inspection schedule (thorough review at 10 years and visuals when the units are open for repair) would be sufficient to prevent a surprise failure.

IPSC staff felt that there was no need to keep a spare LP rotor. We concur so long as there no indication of IGSCC beginning to occur.

6. **High Pressure Rotor:** This component on both units will be replaced as part of the up-rating plan, which will provide spares, although it would certainly entail considerable work to replace the re-designed rotors with the existing ones.

7. **Generator/Turbine Bearings:** (Risk 3, Availability 8)
The site was reported to have spares for Nos. 1 through 5 and 13. Bearing Nos. 6 through 10 are identical and nos. 11 and 12 (generator bearings) are different. Therefore, a total of three bearings are needed in order to have a spare bearing of each type.

IPSC will consider procurement of these additional spares. Re-casting a bearing was reported to take about 72 hours at a foundry in Salt Lake City, explaining why these spares are not currently in inventory. Given the increased importance of keeping the units available, these three bearings should be added to inventory.

8. **Generator Circuit Breaker:** (Risk 2, Availability 10)
IPP has a rebuild kit for the circuit breaker, but this would not be sufficient in the event of a catastrophic failure. Lead-time for obtaining a new breaker could be more than one year. In the

event of a catastrophic failure, staff could replace the breaker with sections of bus duct and use the high side breaker for protection and synchronization.

IPSC will consider the potential impact on transformer protection. RWB will investigate if other utilities carry spares of this type of generator breaker (manufactured by BBC) and the level of interest in a sharing arrangement for spares.

9. **Generator Circuit Breaker Air Compressor:** These air compressors are already scheduled for replacement and were not discussed further.

10. **Generator Step-Up and Starting Transformers:** It was reported that spare units are already in inventory, including bushings.

11. **345-kV Circuit Breakers and Disconnects:** Spares are reported to be available.

12. **DC Valve Components:** It is expected that additional spares will be made available as part of repair work at another DC converter station. This should be an action item for IPSC or LADWP to follow-up on. Between these spares and available spares, it was reported that there is good coverage. The only other alternative would be to construct a spare valve on each end of the Southern Transmission System to cover the risk of a complete failure of one of the valves, which was dismissed as too expensive given the risk.

13. **Primary Air Motors:** (Risk 6, Availability 3)
For each unit, there are two Forced Draft Fan Motors and two Induction Draft Fan Motors. These motors are approaching the end of their life expectancy and the lead-time for new units is on the order of 40 to 52 weeks. IPSC reported these motors to be in their capital plan over the next 2 to 3 years.

14. **Cooling Tower SUS Transformers:** These transformers will be replaced as part of the unit up-rating plan and were not discussed further. Should the upgrade project be delayed, these transformers should be addressed soon by IPSC.

15. **Boiler Feed Pump Turbine Rotor:** (Risk 2, Availability 2)
IPSC is considering replacing these steam driven pumps with electric motor drives. This issue will be handled internally by IPSC and was not discussed further.

16. **Air Compressor Motor:** (Risk 6, Availability 3)
Each unit has four compressors, but is able to run on three. Lead-time for new motors is 40 – 52 weeks. This item is reported to be in the capital budget.

17. **Boiler Tubing:** There are a number of different size tubes that are used in the boiler. The site is currently low on certain sizes and it was agreed that IPSC would address filling in spares with those sizes that are difficult to obtain or have a long lead-time.

18. **Boiler Safety Valves:** Spares are currently available.

19. **Turbine Controls and Solenoid Valves:** These items are only available from GE and have a lead-time of 6 – 10 months. The cost for a complete set is $113,000. IPSC is planning to order these components and they were not discussed further.

20. **Emission Monitoring Systems:** Have redundancy in the systems and there were no critical parts identified.

21. **Conveyor System:** Have spare motor and gear, no other critical components were identified.

22. **Condor:** A lot of discussion related to the performance and adequacy of the Condor boom truck (65' boom). A considerable amount of maintenance has been done to this vehicle, however the hydraulic system was reported to need additional work. This is a tool that needs to be available and there was agreement that budget money would be made available to either repair or replace it.